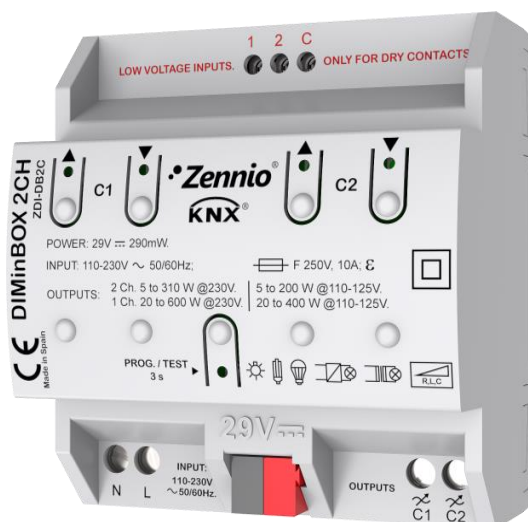




DIMinBOX 2Ch

2-Channel Universal Light Dimmer

ZDI-DB2C

Application program version: [1.0]
User manual edition: [1.0]_a

www.zennio.com

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1 INTRODUCTION

1.1 DlMinBOX 2Ch

DlMinBOX 2Ch is the universal, two-channel, multi-function KNX light dimmer from Zennio. With a maximum per-channel power of 310 W at 230 VAC for resistive (R), inductive (L) and capacitive (C) loads, and of 120 W for dimmable LED / CFL loads (or, respectively, 160 W and 65 W at 110 VAC), it features a wide variety of functions, which make it a versatile and robust device. The most outstanding are:

- Compatibility with **resistive (R)**, **inductive (L)**, **capacitive (C)**, **LED*** and low-consumption **CFL*** loads.

(*) Only dimmable LED / CFL lamps are supported.

- Automatic load type **detection** for conventional lamps (C / F / L),
- Customisable dimming **pattern** for LED and CFL loads,
- Customisable **dimming times**.
- **Individual** or **joint** control of the two output channels,
- **Additional functions**: timed actions, scenes, custom on/off controls, automatic switch-off, sequences, economy mode, channel lock...
- **Manual operation and supervision** of the loads through the on-board pushbuttons.
- 10 customisable, multi-operation **logic functions**.
- 2 **multi-purpose inputs**, configurable as:
 - Temperature probes,
 - Binary inputs (i.e., pushbuttons, switches, sensors),
 - Motion detectors.

- Data storage and load switch-off on **bus power losses**.
- Automatic **error management** (overloads, short-circuits, open circuits, overheating, anomalous network frequencies, power supply failures and wrong load type selection).
- LED **indicators** to show error situations.

1.2 LOAD TYPES

DlMinBOX 2Ch supports the following load types:

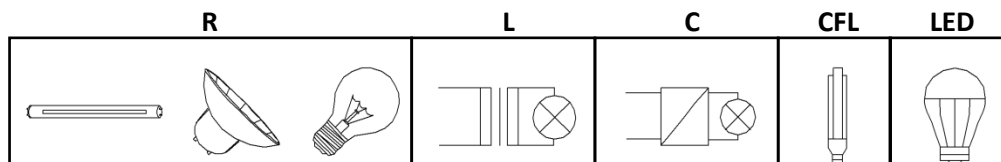


Figure 1 Load Types

• Conventional lamps:

- Resistive (R),
- Inductive (L),
- Capacitive (C),

• Dimmable low-consumption **Compact Fluorescent Lamps (CFL)**.

• Dimmable Light Emitting Diode (**LED**) lamps.

1.2.1 COMBINING LOAD TYPES

In some cases it is possible to combine different load types in the same channel (i.e. it may be possible to control loads of different types together) as long as the following restrictions are satisfied:

- Inductive (L) and resistive (R) loads **can** be combined if the resistive load is less than 50% of the total load.
- Capacitive (C) and resistive (R) loads **can** be combined if the resistive load is less than 50% of the total load.
- Capacitive (C) and inductive (L) loads **cannot** be combined.
- CFL and LED loads **cannot** be combined.
- CFL and conventional (R / L / C) loads **cannot** be combined.
- LED and conventional (R / L / C) loads **cannot** be combined.

- It is advisable **not to combine** different CFL (or LED) loads together in the same channel, as the response may differ depending on the model or maker.

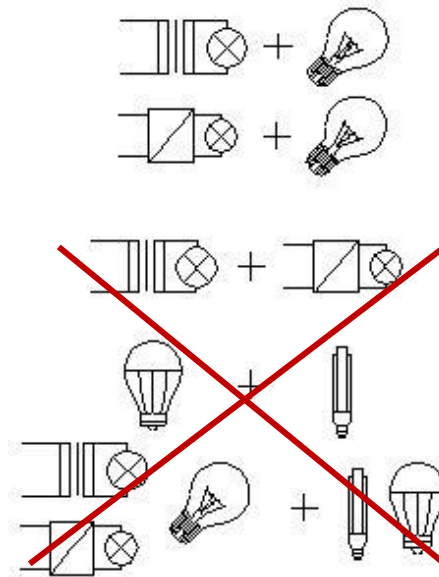


Figure 2. Combining Load Types.

To get further information, please refer to the corresponding **Datasheet**, bundled with the original package of the device and also available at www.zennio.com.

1.3 INSTALLATION

DlMinBOX 2Ch connects to the KNX bus through the on-board KNX connector. Once the device is provided with power from the KNX bus, both the individual address and the associated application program can be downloaded.

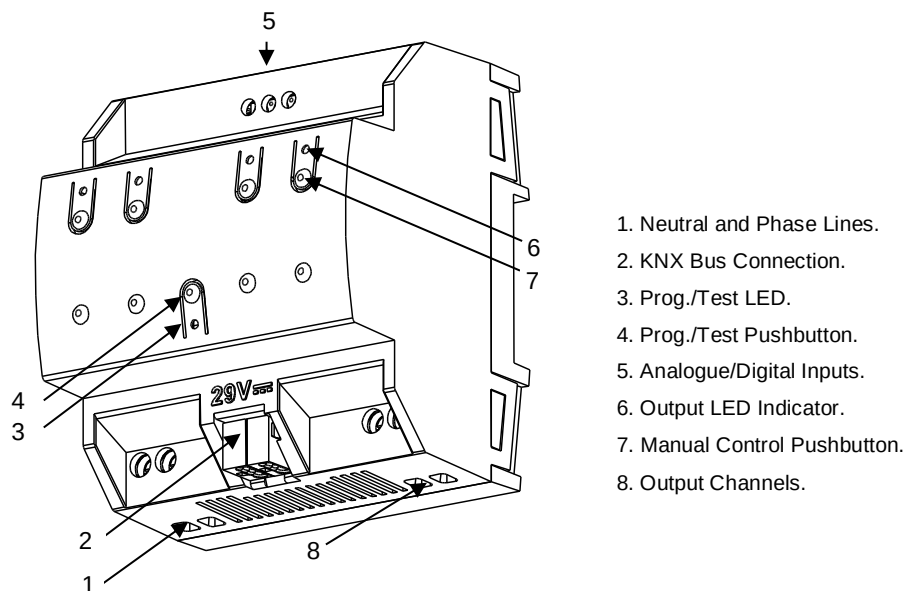


Figure 3 DlMinBOX 2Ch - Element Diagram.

The main elements of the device are described next:

- **Test/Prog. Pushbutton (4):** a short press on this button sets the device into the programming mode, making the associated LED (3) light in red.

Note: if this button is held while plugging the device into the KNX bus, the device will enter into **safe mode**. In such case, the LED will blink in red every 0.5 seconds.

- **Output Channels (8):** slots for the connection of the output lines (loads).
- **Neutral and Phase Lines (1):** slots for the connection of the neutral and phase lines.
- **Analogue/Digital Inputs (5):** input ports for the connection of the stripped cables of external elements such as switches, motion detectors, temperature probes, etc.

To get detailed information about the technical features of the device, as well as on the installation and security procedures, please refer to the corresponding **Datasheet**, bundled with the original package of the device and also available at www.zennio.com.

2 CONFIGURATION

2.1 MAIN CONFIGURATION

The main configuration of DlMinBOX 2Ch requires setting some general parameters as well as some more channel-specific options. Once the basics have been defined, it is also possible to enable and customise some additional functions for each channel.

The next sections of this manual will describe all the process, as well as the options and concepts involved.

ETS PARAMETERISATION

After importing the corresponding database in ETS and adding the device into the topology of the desired project, the configuration process begins by right-clicking into the device and selecting *Edit parameters*.

The tab tree on the left shows the Main Configuration tab in the first place. This entry itself comprises by default three subsections that let the integrator set, respectively, the basic parameters for both channels (C1 and C2). Configuring a joint behaviour of the two channels is also possible, as explained later.

2.1.1 BOTH CHANNELS

The basic configuration that is common for both channels consists in setting the following:

- The **frequency** of the power network (50 Hertz or 60 Hertz).
- The length of the dimming course for the two **Smooth Dimming** functions, which make it possible to increase or decrease the light level of the loads progressively (in contrast to **At Once**). This length is defined as the time for an entire regulation, from a level of 0% (no light) to a level of 100% (full light).

Note: *there are several ways of regulating the light level. Later it will be necessary to set which of them should be done at once and which smoothly.*

- Whether to control the two channels **independently or jointly** (see sections 2.1.2 and 0).
- The **manual control** type, in the case that operating the channels through the on-board pushbuttons is necessary for testing or for other purposes.
- Whether to send **error notifications** or not to the bus.
- Enabling or disabling the **Inputs** module.
- Enabling or disabling the **Logic Functions** module.

ETS PARAMETERISATION

The screenshot shows the 'MAIN CONFIGURATION' section with 'Both channels' selected. The parameters are as follows:

- Frequency:** 50 Hz (dropdown menu)
- Smooth Dimming Times [0% to 100%]:**
 - Smooth Dimming Time 1:** 1 (input field) with a unit dropdown set to 's'.
 - Smooth Dimming Time 2:** 1 (input field) with a unit dropdown set to 's'.
- Independent Channel Control:** Yes (dropdown menu)
- Manual Control:** Test Mode Off + Test Mode On (dropdown menu)
- Lock manual control?:** ☐
- Error Notification:** No (dropdown menu)
- Inputs:** ☐
- Logic Functions:** ☐

Figure 4 Main Configuration - Both Channels.

The **Both Channels** screen contains the following parameters:

- **Frequency:** “50” or “60” Hz.
- **Smooth Dimming Times:** 5 to 50 tenths of a second, 1 to 120 seconds or 1 to 4 minutes. The longer the time, the smoother the light regulation.
- **Independent Channel Control:** while set to “Yes”, two specific tabs (“**Channel C1**” and “**Channel C2**”) will remain available under “Main Configuration” in the tree on the left, as well as two more to configure their respective additional functions (“**Channel C1 Functions**” and “**Channel C2 Functions**”). However, if set to “No”, they will be replaced with the equivalent joint tabs (“**Channel C1+C2**” and “**Channel C1+C2 Functions**”). All of them will be described later.

- **Manual Control:** the options are “Disabled”, “Test Mode Off + Test Mode On”, “Only with Test Mode Off” and “Only with Test Mode On”. Please see section 2.5 for details.
- **Error Notifications:** enables or disables the “Error Notifications” tab (within “Main Configuration”), which contains specific parameters for the case DIMinBOX 2Ch is required to report error events to the KNX bus. Please see section 0 for details.
- **Inputs:** enables or disables the “Inputs” tab, which contains specific parameters for the case of connecting external accessories to DIMinBOX 2Ch. Please see section 2.3 for details.
- **Logic Functions:** enables or disables the “Logic Functions” tab, which contains specific parameters for the case the Logic Functions module is required. Please see section 2.4 for details

2.1.2 CHANNEL Cx

The specific configuration for each channel (in case an independent channel control has been configured; see section 2.1.1) consists in setting the following:

- The **load type**, which may be RCL (conventional loads), CFL or LED. Different dimming patterns are applied for each case. Please see section 1.2 for details.

- In the case of a **conventional** load (RCL), the integrator will have the option to **manually** set the type (R, C or L) or to let DIMinBOX 2Ch perform an **automatic** detection.

Note: *if the integrator opts for setting the conventional type (R, C or L) manually, DIMinBOX 2Ch will be able to notify the KNX installation about the connection of the wrong (conventional) load type. See section 2.1.4.*

- In the case of a **CFL** or a **LED** load, the integrator will have the option to select the dimming pattern (among three options) that best fits the load being regulated. It is also possible to select the dimming mode, that is, whether to regulate the load on the trailing edges of the wave or on the leading edges. Some testing with these options is advisable in order to obtain the best results for the specific lamp being regulated.
- The **type of response** (immediate or smooth, with two smooth speeds available for configuration at the integrator's disposal) of the different light controls: precise dimming (i.e., orders to set a specific light level, expressed in terms of percentage), relative dimming (i.e., orders to increase or decrease the current light level by a certain percentage) and switch-on / switch-off.
- The **load switch-on method**, being possible to configure that the loads always recover their previous light level (the one they had before being switched off; this is referred to as "memory function") or the maximum level.
- Whether to activate the **economical mode** (only for RCL loads), which consists in proportionally reducing the light level (and thus the energy consumption) by applying a certain coefficient (50% to 100%). Note that this is an internal feature, as the KNX bus will still be reported the theoretical light levels and not the actual, reduced levels. However, the dimming times are not

changed, so if, for example the light level has been reduced to 50%, the time it takes to go from 0% to 100% will be half the parameterized.

Note: *the above coefficient alters (shortens) the actual dimming times.*

- The **maximum dimming value** (only for CFL and LED loads), which is a value between 50% and 100% that permits a proportional reduction (similarly as the above economical mode) in order to prevent very high dimming levels, which on certain CFL / LED loads can lead to insufficient energy for the dimmer itself, which may cause flickering or false open-circuit error notifications. It is highly recommended to set a value not greater than 80%.
- The **lowest light level** permitted (0% to 50%), as certain loads may show flickering or behave improperly in particularly low levels. When DIMinBOX 2Ch receives a request to dim the load to a value greater than 0% but lower than the parameterised limit, it will apply the level parameterised as minimum.

ETS PARAMETERISATION

MAIN CONFIGURATION	
Both channels	
Channel C1	
Channel C2	
CHANNEL C1 FUNCTIONS	
CHANNEL C2 FUNCTIONS	

Load Type	RCL
Load Selection Mode	Automatic
Dimming Speed	
Precise Dimming	At Once
Relative Dimming	At Once
On/Off	At Once
Memory function: On Light Level	Maximum
Economical Mode	No
Enable Minimum	No

Figure 5 Channel Cx.

The **Channel Cx** screen (with “x” being “1” or “2”) contains the following parameters:

- **Load Type:** sets the type of the load that will be connected to the output channel. The options are “RCL” (conventional lamps), “CFL” or “LED”.

The following two parameters show up in case of selecting “RCL”:

- **Load Selection Mode:** “Manual” or “Automatic”. And, in case of selecting “Manual”:
 - **Type:** “Resistive (R)”, “Capacitive (C/C+R)” or “Inductive (L/L+R)”.

On the other hand, the following two parameters show up in case of selecting “CFL” or “LED”:

- **Dimming Pattern:** “Lineal”, “Curve 1” or “Curve 2”.
- **Dimming Mode:** “Trailing Edge” or “Leading Edge”.

Important: *please configure these options with caution in order to obtain the best results. Refer to section 1.2 for details.*

- **Dimming Speed:** sets the type of response (immediate or progressive; see section 2.1.1) for the different control orders.
 - **Precise Dimming:** “At Once”, “Smooth 1” or “Smooth 2”.
 - **Relative Dimming:** “At Once”, “Smooth 1” or “Smooth 2”
 - **On/Off:** “At Once”, “Smooth 1” or “Smooth 2”
- **Memory Function:** sets the desired response for the switch-on orders: “Maximum” (maximum light level) or “Previous” (previous light level; that is, a “memory” switch-on).
- **Economical Mode** (only available for **conventional RCL loads**): enables (“Yes”) or disables (“No”) an internal reduction to the light level (and therefore to the energy consumption) by a certain coefficient.
 - **Maximum Dimming Value:** 50% to 100%. The lower the maximum dimming value, the greater the consumption reduction.

- **Maximum Dimming Value** (only available for **CFL and LED loads**): sets the maximum permitted light level (from 50% to 100%), thus permitting an internal reduction to prevent situations of insufficient energy for the dimmer itself. **Values greater than 80% are not recommended.**
- **Enable Minimum:** “Yes” or “No”. And, in case of selecting “Yes”:
 - **Maximum Dimming Value:** 0% to 50%.

On the other hand, the following communication objects will be available:

- **[Cx] On/Off:** one-bit object for the reception of switch orders from the bus. One “1” will switch the light on, while one “0” will switch it off. The dimming speed will be “At Once”, “Smooth 1” or “Smooth 2” according to the parameters, as explained above.
- **[Cx] Dimming:** four-bit object for the reception of dimming orders from the bus. The value of the object will be interpreted as the desired step (brighter or darker), according to the KNX standard. The values “0” and “8” interrupt the current regulation:

Value	Response
0x0 (0)	Stop light dimming
0x1 (1)	Decrease the light level by 100%
0x2 (2)	Decrease the light level by 50%
0x3 (3)	Decrease the light level by 25%
0x4 (4)	Decrease the light level by 12%
0x5 (5)	Decrease the light level by 6%
0x6 (6)	Decrease the light level by 3%
0x7 (7)	Decrease the light level by 1%
0x8 (8)	Stop light dimming
0x9 (9)	Increase the light level by 100%
0xA (10)	Increase the light level by 50%
0xB (11)	Increase the light level by 25%
0xC (12)	Increase the light level by 12%
0xD (13)	Increase the light level by 6%
0xE (14)	Increase the light level by 3%
0xF (15)	Increase the light level by 1%

Table 1 Responses to the 4-bit Dimming Orders.

The dimming speed will be “At Once”, “Smooth 1” or “Smooth 2” depending on the parameterisation, as explained above.

- **[Cx] Precise Dimming:** 1-byte object for the reception of the desired light level (in terms of percentage) from the bus. Once again, the dimming speed will be “At Once”, “Smooth 1” or “Smooth 2” depending on the parameterisation, as explained above.
- **Dimming Speed 1:** one-byte object that permits decreasing the course time of the “Smooth 1” regulations (see section 0). Being “T” the parameterised length, any value written to this object will be interpreted as *how much* this T should be decreased. In other words, writing “25%” to this object will speed up the “Smooth 1” progressive regulations by a 25%, making the light regulation last for 75% of the parameterised time. See Table 2.

Value	Effective Dimming Length (T = parameterised time)
0%	T
25%	$\frac{3}{4}$ T
33%	$\frac{2}{3}$ T
50%	$\frac{1}{2}$ T
75%	$\frac{1}{4}$ T
100%	0

Table 2 Dimming Speed object.

- **Dimming Speed 2:** analogous to the above object, but for “Smooth 2”.

2.1.3 CHANNEL C1+C2

The specific configuration for the two channels (in case a joint channel control has been configured; see section 2.1.1) is entirely analogous to the separated configuration of each channel, although in this case both channels will react together and similarly.

Please refer to section 2.1.2 for details.

2.1.4 ERROR NOTIFICATION

2.1.4.1 BUS NOTIFICATIONS

Although DlMinBOX 2Ch permanently watches for error events and reacts to them to prevent the loads and the device itself, it can also notify the KNX bus about the occurrence of errors, if such option is set in parameters.

The error situations DlMinBOX 2Ch can report are: **short-circuits**, **overvoltage**, **overheat**, **anomalous network frequency**, **power supply failure**, **open circuit** in the load connection and **wrong load type** selection (in case of having parameterised a RCL load and having manually set the type to resistive, capacitive or inductive instead of letting DlMinBOX 2Ch automatically detect it).

2.1.4.2 LED NOTIFICATIONS

In addition to the above, DlMinBOX 2Ch always informs about errors by means of the on-board **LED indicators**. In case of concurrence of multiple errors, DlMinBOX 2Ch will only notify about the one with a higher priority – other errors with a lower priority (on whatever channel) will not be notified by the LEDs until the former is over. Table 3 shows the error priority and codes.

Priority	Error	Notification
1	Short Circuit	The two LEDs of the channel blink alternatively.
2	Overvoltage	One of the two LEDs of each channel remains on and the other one blinks every 0.5 seconds.
3	Overheat	All the four LEDs remain on.
4	Power Supply Failure	Two LEDs (one per channel) blink together every one second.
5	Anomalous Frequency	All the four LEDs blink in sequence every 0.5 seconds.
6	Open Circuit	The two LEDs of the channel blink together every 1 second.
7	Wrong Load Type	One of the two LEDs of the channel remains on and the other one blinks rapidly.

Table 3 Error Notification through the on-board LEDs.

2.1.4.3 REACTION TO ERRORS

For safety reasons and with independence of the bus notifications, DlMinBOX 2Ch always takes an action when an error is detected. As explained in the next lines, the particular action depends, in practice, on the error that takes place.

Note that when this action implies disconnecting the load (i.e., opening the output relay), DlMinBOX will obviously no longer be aware of short-circuit, overvoltage, wrong load type or open-circuit situations, although other errors will still be monitored.

In the case of multiple errors happening at the same time, DlMinBOX 2Ch will focus on the error with a higher priority (see Table 3), which is supposed to trigger a more restrictive response action.

- **Short Circuit:** when a short circuit takes place, DlMinBOX 2Ch disconnects the load and waits until a new dimming command is received. When that happens, it will simply try to dim the load and will repeat the process if a new short circuit is detected.

In case of more than **three short circuits in less than two minutes** time (without resetting the device), DlMinBOX 2Ch will remain **locked** for three minutes and ignore any dimming order addressed to that channel. The lock status will be notified to the KNX bus (if configured in parameters), and also by a blue intermittence of the Prog./Test LED.

- **Overvoltage:** when an overvoltage situation takes place, DlMinBOX 2Ch disconnects the load and waits until a new dimming command is received. When that happens, it will simply try to dim the load and will repeat the process if a new overvoltage is detected.

In case of more than **three overvoltages in less than two minutes** time (without resetting the device), DlMinBOX 2Ch will remain **locked** for three minutes and ignore any dimming order addressed to that channel. The lock status will be notified to the KNX bus (if configured in parameters), and also by turning on (in blue colour) the Prog./Test LED.

- **Overheat:**

- When the internal temperature of DlMinBOX 2Ch results to be **between**

73°C and 75°C, the device will lower the light level of the channels to 20%, ignoring later orders to increase the level. Once the temperature is lower than 73°C, the device will resume the normal behaviour, although the light level will remain as is until a new dimming order is received.

- When the internal temperature results to be **over 75°C**, the device will completely disconnect both channels and switch the loads off. All orders to increase the light level will be ignored. When the temperature falls below 73°C, the device will resume the normal behaviour, although the light level will remain as is until a new order is received.
 - In addition to the above, DlMinBOX 2Ch is equipped with a **resettable fuse**, which provides extra protection to the circuitry. Under situations of abnormally high temperature that cannot be solved by disconnecting the loads, this fuse will blow out, thus interrupting all communications and turning DlMinBOX 2Ch completely off.
- **Power Supply Failure:** when DlMinBOX 2Ch detects a drop of the power supply, it disconnects both channels and waits until it recovers. Whether the channels should remain off after the power recovery or recover their previous light levels can be parameterised (see section 2.2.9).
 - **Anomalous Frequency:** when DlMinBOX 2Ch detects an abnormal frequency in the power network, it will react analogously as for the Power Supply Failure. During the anomalous frequency error, the device will still be able to detect drops of the power supply.
 - **Open Circuit:** when an open-circuit situation takes place, DlMinBOX 2Ch switches off the loads and starts ignoring any orders to dim the loads. However, in this case it does not actually disconnect the loads (i.e., it applies a light level of 0% but does not open the output relays), which makes it possible to automatically detect the end of the open circuit. When that happens, the loads will recover their previous state, or switch on or stay off (depending on the parameterisation; see section 2.2.9).
 - **Wrong Load Type:** when DlMinBOX 2Ch detects that the (conventional) load parameterised does not correspond to the load connected to the device, it will disconnect the output channel and wait until a new dimming order is received.

When that happens, it will simply try to dim the load and will repeat the process if the load type is still wrong.

ETS PARAMETERISATION

If “Error notifications” has been enabled in the Both Channels tab (see section 0), an additional entry will be shown in the tab tree on the left.

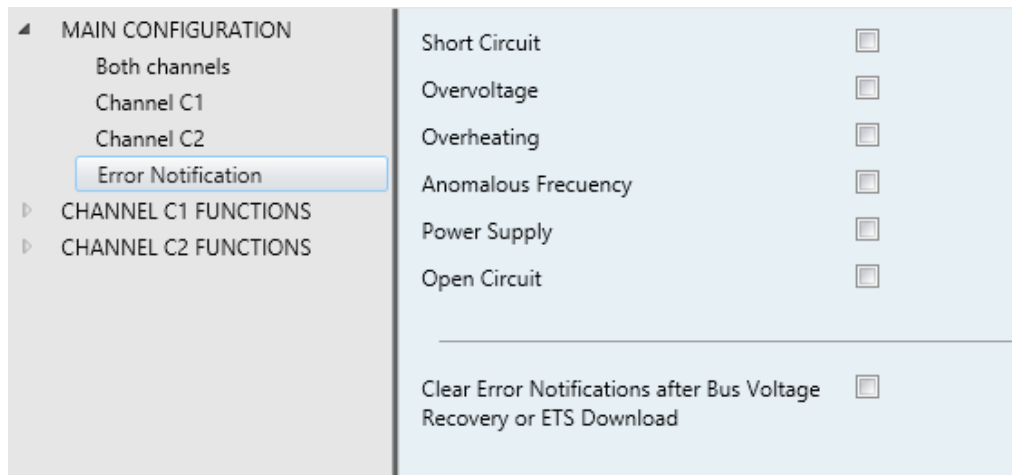


Figure 6 Error Notification.

This screen contains one checkbox per error situation (including “Wrong Load Type Selection”, in case of parameterising a conventional load). Marking any of them will add a specific one-bit communication object to the project topology (or two, if the error is channel-dependent but a two-channel control has been configured).

The specific error objects are:

- [Cx] Open Circuit,
- Power Supply Fault,
- [Cx] Short Circuit,
- Overheating,
- [Cx] Overvoltage,
- Anomalous Frequency.
- [Cx] Wrong Load Type Parameterization.

These objects are sent to the bus with the value “1” whenever the error they refer to is observed to take place. Once the undesired situation is over, they are sent with the value “0”. Note that, as already explained, if several errors take place at the same time, the response action to the error with the highest priority may mask the other errors, which may therefore not be reported until the former is solved.

There is also a secondary object related to some of the error situations:

• **[Cx] Lock due to overvoltages:**

• **[Cx] Lock due to short circuits**

When DlMinBOX 2Ch gets automatically locked after detecting one of these errors multiple times in a brief period, the lock object corresponding to that error will be sent with value “1”. Once the lock state is over, it will be sent with value “0”.

Back to the parameters, one more is shown in addition to the above checkboxes:

- **Clear Error Notifications after Bus Voltage Recovery or ETS Download:**
sets whether the previous state of the enabled error objects should be cleared during the start-up of the device (i.e., whether they should be sent with the value “0” to the KNX bus).

This does not mean that DlMinBOX 2Ch will ignore any errors still taking place after the device start-up (in such case, the corresponding object will be sent with the value “1” after being sent with the value “0”), but may be useful to *force* all error states to zero in the beginning, to update other devices in the KNX installation.

2.2 FUNCTIONS

2.2.1 CONFIGURATION

The options described so far are related to the basics and to the light dimming function itself. However, DlMinBOX 2Ch offers some more additional functions, which are disabled in parameters by default.

The next subsections describe each of them: **status objects**, **custom On/Off** controls, **simple timer**, **flashing**, **scenes and sequences**, **channel lock** by object, **automatic switch-off** and **initialisation settings**.

ETS PARAMETERISATION

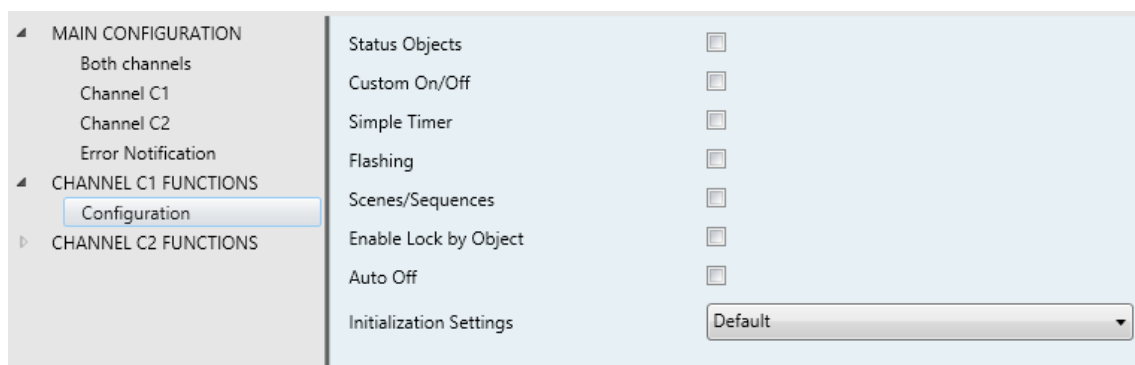


Figure 7 Functions.

The Configuration tab of the channel functions is available by default in the tab tree on the left. It consists of a set of checkboxes for all the available functions. Marking any of them will bring **a new entry to the tab tree** for the parameterisation of that particular function (with the exception of “Enable Lock By Object”, which has no parameters involved).

One drop-down box is also provided to select the desired **initialisation** of the device (“Default” or “Custom”).

The next subsections describe each of these functions.

2.2.2 STATUS OBJECTS

This function allows implementing, for that particular channel, a one-bit on/off status object and a one-byte (percentage) status object that will report the channel state at any time, thus informing other devices in the KNX installation, if required. These objects are disabled by default.

Regarding the one-bit object, it is possible to specify what the value "1" should mean, as it is possible to send it to the bus as long as the light level is higher than 0% or only when it reaches 100%.

ETS PARAMETERISATION

Figure 8 Status Objects.

This Status Objects specific screen contains the following parameters:

- **Send On/Off Status:** enables the "[Cx] On/Off (Status)" 1-bit communication object, which reports the on/off state of the output channel when it changes. If enabled, the following parameter also shows up:
 - **Send On/Off=1 when:** sets when the value "1" will be sent through object "[Cx] On/Off (Status)" to the bus, being the following options possible:
 - Lighting level is not equal to 0%: when the brightness level gets to a value different from 0%, the object "[Cx] On/Off (status)" will send the value "1". The value "0" will be only sent when the level reaches 0%.
 - Lighting level is equal to 100%: the "[Cx] On/Off (Status)" object will only send the value "1" when the brightness level gets to 100%. The value "0" will be sent in any other case (luminosity not equal to 100%).

The On/Off status object is always sent back to the bus after the reception of an On/Off order through the analogous control object.

- **Send Lighting Level Status (%)**: enables the "[Cx] Lighting Level (Status)" one-byte communication object, which reports –whenever it changes– the status of the light level applied to the output channel in terms of percentage, with an accuracy of $\pm 1\%$. If enabled, the following parameter also shows up:
 - **Min. Time Between Consecutive Sendings**: sets every how much time the status object should be sent to the bus during progressive (smooth) dimming. The available range is 1 to 120 seconds or 1 to 4 minutes. The default value is 3 seconds.

2.2.3 CUSTOM ON/OFF

This function brings the chance to enable up to two additional On/Off controls for the output channel, and therefore up to two new communication objects to switch the load on or off.

These additional controls allow customising the light level of the output for the “on” and the “off” states and whether the commutation should be performed at once or smoothly.

The custom On/Off function is particularly useful when the dimmer is required to set a specific brightness level for each room (children bedrooms, hospitals rooms, etc.), other than the maximum light level of the normal On/Off control. In such cases, both functions (Normal and Custom On/Off) can coexist and be used depending on the situation.

ETS PARAMETERISATION

Once enabled, the Custom On/Off specific screen offers up to two additional On/Off controls for the channel.

The screenshot displays the ETS parameterisation interface for Custom On/Off controls. It is divided into two main sections: Custom On/Off 1 and Custom On/Off 2. Each section contains a checkbox to enable the control, followed by two input fields for 'Lighting Level at On' and 'Lighting Level at Off' (both with percentage signs), and two dropdown menus for 'On Type' and 'Off Type'. In the Custom On/Off 2 section, the 'Off Type' dropdown is open, showing three options: 'At Once', 'Smooth 1', and 'Smooth 2'.

Figure 9 Custom On/Off.

Both can be independently configured through the following parameters:

- **Lighting Level at On:** sets the desired light percentage (0% - 100%) to be applied to the channel when the value "1" is received through the "[Cx] Custom On/Off Y" 1-bit communication object (being "Y" equal to 1 or 2).
- **On Type:** sets the desired dimming type for the custom switch-on of the channel: At once, Smooth 1 or Smooth 2.
- **Lighting Level at Off:** sets the desired light percentage (0% - 100%) to be applied to the corresponding channel when the value "0" is received through the "[Cx] Custom On/Off Y" 1-bit communication object.
- **Off Type:** sets the desired dimming type for the custom switch-off of the channel: At once, Smooth 1 or Smooth 2.

2.2.4 SIMPLE TIMER

This function allows performing (on the reception of the value “1” through the simple timer object) a switch-on of the load connected to the channel of DMinBOX 2Ch and a later, automatic (timed) switch-off, being also possible to add delays and to parameterise the time length, the luminosity level and the dimming type.

The timed switch-off can also be triggered on demand before the time count ends, by writing the value “0” to the simple timer object.

This function may be useful in motion-dependent light control situations, or when the load needs to be switched on and then switched off automatically after a certain time.

ETS PARAMETERISATION

Once enabled, the following parameters can be configured from the Simple Timer specific tab:

The screenshot displays a configuration window for the Simple Timer function. It includes the following settings:

- Lighting Level at On:** A numeric input field set to 100, followed by a percentage symbol (%).
- On Delay (0 = No Delay):** A numeric input field set to 0, with a unit dropdown menu currently showing 's' (seconds).
- Off Delay (0 = No Delay):** A numeric input field set to 0, with a unit dropdown menu currently showing 's' (seconds).
- On Duration (0 = Endless):** A numeric input field set to 0, with a unit dropdown menu currently showing 's' (seconds).
- On/Off Type:** A dropdown menu set to 'At Once'.
- Enable Retriggering:** A checkbox that is checked.
- Multiply:** A checkbox that is unchecked.

Figure 10 Simple Timer.

- **Lighting Level at On:** sets the desired light percentage (10% - 100%) to be applied when the timed switch-on is triggered ([Cx] Simple Timer = 1).

- **On Delay:** sets the time DlMinBOX 2Ch will wait since the reception of the timed switch-on order and the actual switch-on of the load. The allowed values are: 0 to 3600 s, 0 to 1000 min, 0 to 100h. If no delay is needed, this field should remain at zero.
- **Off Delay:** analogous to the previous parameter, but for the timed switch-off orders ([Cx] Simple Timer = 0).
- **On Duration:** sets the time the load will stay on before automatically switching off. Allowed values are: 0 – 3600 s, 0 – 1000 min, 0 – 100h. The value “0” in this field means that the load should remain on until a contrary order is received.
- **On/Off Type:** sets the dimming type to be applied during the timed switch-on and switch-off of the channel: At once, Smooth 1 or Smooth 2.
- **Enable Retriggering:**
 - Disabled: successive arrivals of the Timer On order will not reset the timer.
 - Enabled + Multiply: if the output has already been switched on and the On Duration time is counting, the count will be restarted whenever another “1” is received through the “[Cx] Simple Timer” communication object.
 - Enabled + No Multiply: if the output has already been switched on and the On Duration time is counting, then the actual duration will be “n” times the parameterised time, being “n” the number of times the value “1” is received through the “[Cx] Simple Timer” communication object.

The above parameter does not affect the On and Off Delays:

- If the On (or Off) delay count is running, the timer will NOT be reset even if a new “1” (or a new “0”) is received through the “[Cx] Simple Timer” object.

During the simple timing, receiving any other order to regulate the load will interrupt the time count and make DlMinBOX 2Ch execute the new request.

2.2.5 FLASHING

This function allows running **ON-OFF** sequences with customisable lengths (and light levels) for the “ON” and the “OFF” states. It is also possible to set the number of repetitions (up to 255, or otherwise endless), as well as the light level of the output after the last repetition (or when an order to interrupt the flashing is received).

The flashing sequence starts when DMinBOX receives a “1” through the flashing object and stops once it has executed all the configured repetitions (unless an endless sequence has been parameterised). It is possible to interrupt the flashing sequence at any time by sending one “0” to the flashing object. Sending any other control order (e.g., ON/OFF, scenes, etc.) will also interrupt it. Also, it is possible to send the device the order to re-start the flashing sequence during the execution.

ETS PARAMETERISATION

Once the function has been enabled, the following parameters can be configured from the Flashing specific screen:

Lighting Level at On	100	%
On Duration	2	s
Off Duration	2	s
Number of Repetitions (0 = Endless)	0	
Final Lighting Level	0	%

Figure 11 Flashing.

- **Lighting Level at On:** sets the desired light percentage (10% - 100%) to be applied to the load during the “on” stages.

- **On Duration:** sets the length of the “on” stages. The available values are 1 to 3600 seconds, 1 to 1000 minutes, 1 to 24 hours (2 seconds by default).
- **Off Duration:** analogous to the above parameter, but for the “off” stages.
- **Number of repetitions:** number of times the On/Off cycle will repeat during the sequence (from 0 to 255). For endless flashing, please enter “0”; in such case the sequence will repeat until an order to interrupt it (or any other dimming order: On/Off, scenes, etc.) is received.

Note: *the sequence is triggered by writing the value “1” to object “[Cx] Flashing”, and interrupted by writing the value “0” to the same object.*

- **Final Lighting Level:** sets the desired light percentage (10% - 100%) after the last repetition or after the reception of the value “0” through “[Cx] Flashing”.

2.2.6 SCENES/SEQUENCES

This function allows defining up to ten scenes per channel, which consist in a specific light ambient or dimming sequence than can be triggered by sending the corresponding scene number to the device.

An one-bit object is also provided to (re)start the last scene execution, and to stop it.

ETS PARAMETERISATION

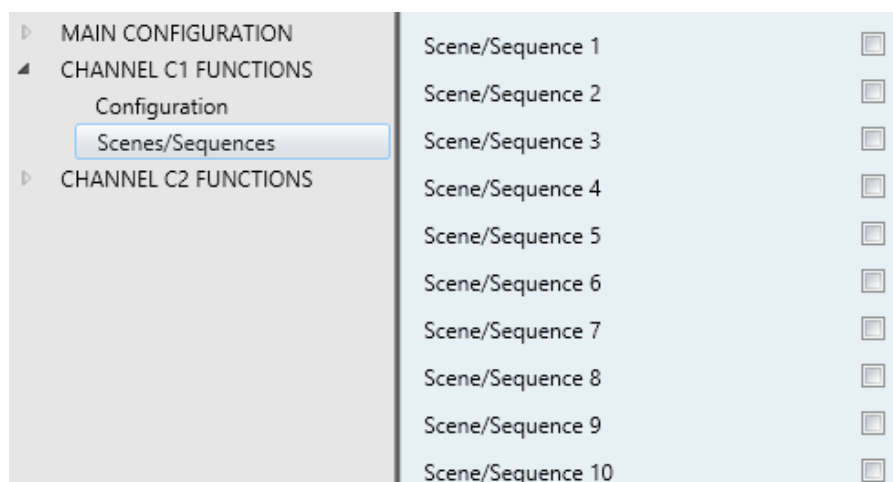


Figure 12 Scenes/Sequences.

Once this function has been enabled, each of the **ten scenes/sequences** can be individually configured from the “Scenes/Sequences” specific screen.

One checkbox is shown for each of them. Marking one of these checkboxes brings a new entry to the tab tree, from which it is necessary to configure some fields.

Figure 13 Scene.

Scene/Sequence Number	1
Scene/Sequence Type	Custom Sequence
Cyclic	No
Next Scene/Sequence	None
Lighting Level Status Sending	Send continuously
Action 1	☒
Lighting Level	0 %
Duration	2
	5
Dimming Type	At Once
Action 2	☐
Action 3	☐
Action 4	☐
Action 5	☐

Figure 14 Sequence.

These fields are:

- **Scene/Sequence number:** sets the scene/sequence identifying number (from 1 to 64). The reception of this number (subtracting 1, according to the KNX standard) through the “[Cx] Scenes/Sequences” object will make the controller perform the corresponding actions.
 - **Scene/Sequence type:** selects the desired type of response:
 - **Scene: Lighting Level.** The scene will consist in setting a certain light level (specified in “Lighting Level”) when the “[Cx] Scenes/Sequences” object is received with the proper scene number.
- “Dimming type” allows setting whether to apply the new level At Once, or progressively (Smooth 1 or Smooth 2).

- **Custom sequence.** The response will consist in a customisable sequence of up to five steps/actions, defined through the following parameters:
- **Cyclic:** “Yes” will define a cyclic sequence (after the last step, the sequence will start over), while “No” will define a non-cyclic sequence.
 - **Next Scene/Sequence:** this parameter offers the possibility of triggering –after the last step of the sequence– another sequence.
 - **Lighting Level Status Sending:** if set to “Send continuously”, the light level will be sent to the KNX bus through “[Cx] **Lighting Level (Status)**” during smooth dimming (provided that the option to send the status objects has been activated; see section 2.2.2). If set to “Send when sequence ends”, the level will be sent to the bus once the last step of the sequence finishes, even if the sending of the status is enabled or not. In both cases, however, the Status Objects function should have been enabled (see section 2.2.2).

For every step (action), the following parameters are required:

- **Lighting Level:** sets the desired luminosity for the step (0% to 100%).
- **Duration:** sets the time length of the step (i.e., the action time). The available values are 1 – 3600 seconds, 1 – 1000 minutes, and 1 – 24 hours (2 seconds by default).

Note: *the time space defined here refers to the entire step action, including (if applicable) the smooth dimming time. In case the dimming is too slow and the step action time too short, only a partial light transition will take place.*

- **Dimming type:** sets the dimming type for the transition between the steps: At once, Smooth 1 or Smooth 2.

An object named “[Cx] **Start/Stop Sequence**” is provided in case a sequence needs to be interrupted (value “0”) or re-started (value “1”). If the value “1” is received while no sequence was being run, the last sequence will be triggered again (or the first one parameterised, if no sequences have been executed before). Note that this object only applies to sequences, not to static scenes.

Besides running a scene it is also possible to save it: if the device receives an order to save the scene (values 128-191 through “[Cx] **Scenes/Sequences**”), the current luminosity level of the load (and the dimming speed) will be saved, but only if the value corresponds to any of the parameterised scenes (if not, the order will be ignored).

2.2.7 LOCK CHANNEL

This function permits locking the channel by sending a "1" through a specific one-bit communication object. From that moment, any action being executed by the channel will stop and the load will maintain the brightness value it currently has.

Dimming orders during the lock state will be ignored, while objects common to both channels not implying changes in their light levels will still respond.

DlMinBOX 2Ch will unlock the channel when the value "0" arrives through the lock object. The channel will still maintain the same luminosity level: any request received during the lock state will not be run by the channel after the unlock event.

After a power failure, the channel will maintain the lock state and the light level: the **Initialization Settings** (see section 2.2.9) will not apply in this case.

Note that the **Auto Off** (section 2.2.8) function will also be available during the lock.

ETS PARAMETERISATION

This function has no parameters. Enabling it in the Configuration screen of the channel simply adds an object ("**[Cx] Lock**") to the project topology.

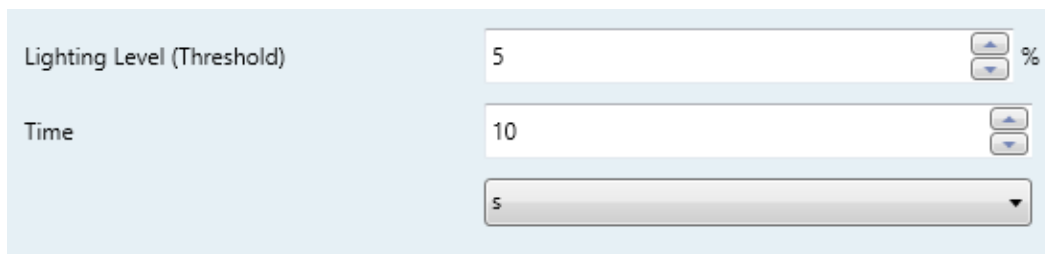
When this object receives the value "1" the channel will become locked, while the value "0" will resume the normal behaviour.

2.2.8 AUTO OFF

If the Auto Off function is enabled, the load controlled by the channel will automatically turn off after a certain time with a light level lower than a parameterisable limit.

The Auto Off function counts the time elapsed after the output falls below a certain threshold light level. If this count exceeds the parameterised timeout, DlMinBOX 2Ch will turn the load off. The count will stop if an order to increase back the light level over that limit is received.

ETS PARAMETERISATION



Lighting Level (Threshold)	5	%
Time	10	
	s	

Figure 15. Auto Off.

The only parameters contained by the Auto Off specific screen are:

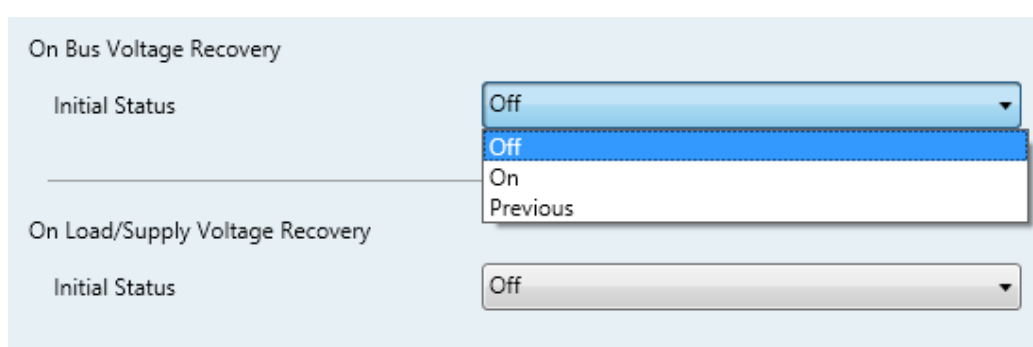
- **Lighting Level (Threshold):** sets the desired light level (5% to 50%) that will trigger the time count.
- **Time:** sets the time that should elapse before turning the channel off. The available values are 10 to 3600 seconds, 1 to 1000 minutes and 1 to 24 hours.

2.2.9 INITIALIZATION SETTINGS

This function is provided to let the integrator specify the desired load state after DlMinBOX 2Ch recovers from a KNX bus failure or a power supply failure.

In case the integrator feels comfortable with the **default** initialisation settings (load off after an ETS download, and previous light level after a bus or power supply recovery), it will not be necessary to configure this function.

ETS PARAMETERISATION



The screenshot displays the 'Initialization Settings' interface. It contains two main sections, each with a label and an 'Initial Status' dropdown menu. The first section, 'On Bus Voltage Recovery', has its dropdown menu open, revealing three options: 'Off' (which is highlighted in blue), 'On', and 'Previous'. The second section, 'On Load/Supply Voltage Recovery', has its dropdown menu closed, showing 'Off' as the selected option.

Figure 16 Initialization Settings.

If parameter “**Initialization Settings**” (see section 2.2.1) is set to “Custom” (otherwise, DlMinBOX 2Ch will implement the already-described default load initialisation), a specific entry (“**Initialisation Settings**”) will be added to the tab tree.

From this new screen, it is possible to set the “**Initial Status**” of the load (both after a bus recovery or a power supply recovery) to either “Off”, “On” or “Previous”.

If the above is set to “On”, then an additional parameter will show up (“**Lighting Level**”) to set the desired light level, in terms of percentage.

2.3 INPUTS

DlMinBOX 2Ch incorporates **two analogue/digital inputs**, each configurable as a:

- **Binary Input**, for the connection of a pushbutton or a switch/sensor.
- **Temperature Probe**, to connect a temperature sensor (model ZN1AC-NTC68 S/E/F from Zennio).
- **Motion Detector**, to connect a motion detector (model ZN1IO-DETEC-P from Zennio).

Important: older models of the Zennio motion detector (e.g., ZN1IO-DETEC and ZN1IO-DETEC-N) will not work properly with DlMinBOX 2Ch.

ETS PARAMETERISATION

When **Inputs** has been activated in the General parameters screen, the following drop-lists will be available for the selection of the specific functions required.

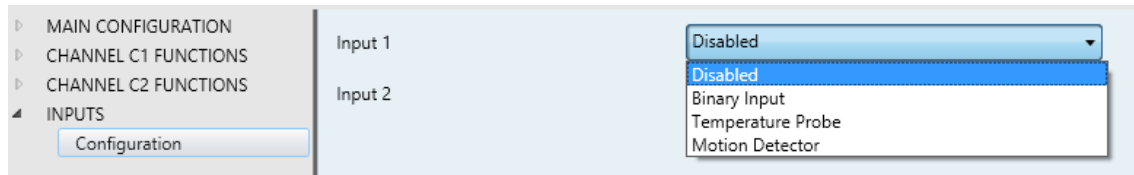


Figure 17. Inputs - Configuration

All inputs are disabled by default. Depending on the function selected for each input, additional tabs will be included in the menu on the left.

2.3.1 BINARY INPUT

Please refer to the specific user manual “**Binary Inputs in DlMinBOX 2Ch**”.

2.3.2 TEMPERATURE PROBE

Please refer to the specific user manual “**Temperature Probe in DlMinBOX 2Ch**”.

2.3.3 MOTION DETECTOR

It is possible to connect motion detectors (models **ZN1IO-DETEC-P** and **ZN1IO-DETEC-X** from Zennio) to the input ports of DlMinBOX 2Ch. This brings the device with the possibility of monitoring motion and presence in the room, as well as the light level. Depending on the detection, different response actions can be parameterised.

Please refer to the specific user manual “**Motion Detector in DlMinBOX 2Ch**” (available at the Zennio homepage, www.zennio.com) for detailed information about the functionality and the configuration of the related parameters.

On the other hand, please keep in mind that motion detectors with references ZN1IO-DETEC and ZN1IO-DETEC-N may report inaccurate measurements if connected to DlMinBOX 2Ch.

Moreover, when connected to DlMinBOX 2Ch, the rear micro-switch of models ZN1IO-DETEC-P and ZN1IO-DETEC-X should be set to “**3.3 V**” (and not to “5 V”). Please refer to the motion detector specific user manual for details.

Note: *the ZN1IO-DETEC-P motion detector is compatible with a variety of Zennio devices. However, depending on the device it is actually being connected to, the functionality may differ slightly. Therefore, please refer specifically to the aforementioned user manual “**Zennio Motion Detector for DlMinBOX 2Ch**”.*

2.4 LOGIC FUNCTIONS

This module makes it possible to perform numeric and binary operations to incoming values received from the KNX bus, and to send the results through other communication objects specifically enabled for this purpose.

DlMinBOX 2Ch can implement **up to ten different and independent functions**, each of them entirely customisable and consisting in **up to five consecutive operations each**.

The execution of each function can depend on a configurable **condition**, which will be evaluated every time the function is **triggered** through specific, parameterisable communication objects. The result after executing the operations of the function can also be evaluated according to certain **conditions** and afterwards sent (or not) to the KNX bus, which can be done every time the function is executed, periodically or only when the result differs from the last one.

Please refer to the specific user manual “**Logic Functions module for DlMinBOX 2Ch**” (available at the Zennio homepage, www.zennio.com) for detailed information about the functionality and the configuration of the related parameter.

2.5 MANUAL CONTROL

The two output channels of DlMinBOX 2Ch can be manually operated and verified by means of the **on-board pushbuttons** (two pushbuttons per channel), located on the top side of the device.

Two alternate approaches are provided for this manual control:

- **Test On Mode**, intended for testing the installation and the loads while setting up the device.
- **Test Off Mode**, intended for any other purposes during normal, long-term operation of the device.

ETS lets configuring **which of the two modes** (if not both) should be accessible. Moreover, a specific **object** can also be enabled in parameters in order to lock/unlock the manual control in runtime (to prevent undesired use, for example).

The **Test Off Mode is active any time** (unless disabled in parameters), which means that the on-board pushbuttons will work according to this mode by default.

On the other hand, **switching to the Test On Mode** (unless disabled in parameters) is done by holding the Prog/Test button for at least three seconds. This will turn the LED yellow. Once the button is released, the LED will become green (which means the Test On Mode is now active). Pressing the button again will turn the LED off, which will mean the Test Off Mode has become the active mode again

In case of having parameterised a joint control of both channels, only the pushbuttons of channel A will have effect (on both channels, in this case).

Note: *both manual control modes come enabled from factory.*

2.5.1 TEST ON MODE

Under this mode, the output channels will be controllable only by means of the manual control itself. Any orders received from the KXN bus will be ignored, and the status objects will not be sent to the bus either.

The error notification, lock and timed functions will remain inoperative as well. On the other hand, the **Economical mode** and the **Minimum Light Level** will still apply,

Note that the Test On Mode will not be accessible while one of the channels has been deactivated for safety reasons (i.e., after the detection of an error; see section 2.1.4.3).

Regarding the loads themselves, their reaction to the **short and long presses** will be as follows:

- **Short press:** the load will switch on or off, depending on the button.
- **Long press:** depending on the button, the load will keep progressively increasing or decreasing the light level until the button is released. The speed of this regulation will be the one that had been parameterised in ETS for the relative dimming.

2.5.2 TEST OFF MODE

Operating the manual control under this mode will be entirely analogous as receiving orders from the KNX bus. In fact, the device will still respond to any requests from the bus, and will send the status objects when corresponding.

Under the Test Off Mode, the loads react to the **short and long presses** the same way they would in the Test On Mode:

- **Short press:** the load will switch on or off, depending on the button.
- **Long press:** depending on the button, the load will keep progressively increasing or decreasing the light level until the button is released. The speed of this regulation will be the one that had been parameterised in ETS for the relative dimming.

ANNEX I: COMMUNICATION OBJECTS

- **“Functional range”** shows the values that, with independence of any other values permitted by the bus according to the object size, may be of any use or have a particular meaning because of the specifications or restrictions from both the KNX standard or the application program itself.
- **“1st boot”** shows the cases where an object is assigned a certain value by the application program after a device download or a full reset. In case the value of such assignment can be parameterised, ✓ is shown in column “P”. Objects showing a hyphen (-) are not assigned a particular value and therefore can be assumed to be initialised with the value “0”, or with the corresponding updated value in case they depend on an external element (sensors, etc.). Moreover, if the object is sent (or is there an option to send it) to the bus (write or read requests) after a download or a device reset from ETS, the marks **(W)** or **(R)** will be shown, respectively for transmissions or read requests.
- **“Reboot”** shows the cases where an object is assigned a certain value by the application program after a bus power failure. In case the value of such assignment can be parameterised, ✓ is shown in column “P”. Objects showing a hyphen (-) are not assigned a particular value and therefore can be assumed to maintain their previous value after the failure, or with the corresponding updated value in case they depend on external elements. Moreover, if the object is sent (or is there an option to send it) to the bus (write or read requests) after a bus failure, the marks **(W)** or **(R)** will be shown, respectively for transmissions or read requests.

Number	Size	I/O	Flags	Data type (DPT)	Functional Range	1st Boot	P	Reboot	P	Name	Function
1	1 Bit	I	C - - W -	DPT_Switch	0/1	-		-		[C1] On/Off	0=Off; 1=On
	1 Bit	I	C - - W -	DPT_Switch	0/1	-		-		[C1+C2] On/Off	0=Off; 1=On
2	1 Bit	I	C - - W -	DPT_Switch	0/1	-		-		[C2] On/Off	0=Off; 1=On
3	4 Bit	I	C - - W -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) 0x2 (Dec. by 50%) 0x3 (Dec. by 25%) 0x4 (Dec. by 12%) 0x5 (Dec. by 6%) 0x6 (Dec. by 3%) 0x7 (Dec. by 1%) 0x8 (Stop) 0x9 (Inc. by 100%) 0xA (Inc. by 50%) 0xB (Inc. by 25%) 0xC (Inc. by 12%) 0xD (Inc. by 6%) 0xE (Inc. by 3%)	-		-		[C1] Dimming	4 bits dimmer ctrl

					0xF (Inc. by 1%)				
	4 Bit	I	C - - W -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	-	-	[C1+C2] Dimming	4 bits dimmer ctrl
4	4 Bit	I	C - - W -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	-	-	[C2] Dimming	4 bits dimmer ctrl
5	1 Byte	I	C - - W -	DPT_Scaling	0% - 100%	-	-	[C1] Precise Dimming	1 byte dimmer ctrl
	1 Byte	I	C - - W -	DPT_Scaling	0% - 100%	-	-	[C1+C2] Precise Dimming	1 byte dimmer ctrl
6	1 Byte	I	C - - W -	DPT_Scaling	0% - 100%	-	-	[C2] Precise Dimming	1 byte dimmer ctrl
7	1 Byte	I/O	C - R W -	DPT_Scaling	0% - 100%	-	-	Dimming Speed 1	0%=Min. Speed; 100%=Max. Speed
8	1 Byte	I/O	C - R W -	DPT_Scaling	0% - 100%	-	-	Dimming Speed 2	0%=Min. Speed; 100%=Max. Speed
9	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Open Circuit	0=No error; 1=Error
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Open Circuit	0=No error; 1=Error
10	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C2] Open Circuit	0=No error; 1=Error
11	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	Power Supply Fault	0=No error; 1=Error
12	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Short Circuit	0=No error; 1=Error
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Short Circuit	0=No error; 1=Error
13	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C2] Short Circuit	0=No error; 1=Error
14	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Lock due to short circuits	0=Unlocked; 1=Locked
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Lock due to short circuits	0=Unlocked; 1=Locked
15	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C2] Lock due to short circuits	0=Unlocked; 1=Locked
16	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	Overheating	0=No error; 1=Error
17	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Overvoltage	0=No error; 1=Error
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Overvoltage	0=No error; 1=Error
18	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C2] Overvoltage	0=No error; 1=Error
19	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Lock due to overvoltages	0=Unlocked; 1=Locked
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Lock due to overvoltages	0=Unlocked; 1=Locked
20	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C2] Lock due to overvoltages	0=Unlocked; 1=Locked
21	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	Anomalous Frequency	0=No error; 1=Error
22	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1] Load Type parameterization error	0=No error; 1=Error
	1 Bit	O	C T R - -	DPT_Alarm	0/1	- W	- W	[C1+C2] Load Type parameterization error	0=No error; 1=Error

23	1 Bit	O	CTR--	DPT_Alarm	0/1	- W	- W	[C2] Load Type parameterization error	0=No error; 1=Error
24	1 Bit	O	CTR--	DPT_Switch	0/1	- W	✓ - W	✓ [C1] On/Off (Status)	0=Off; 1=On
	1 Bit	O	CTR--	DPT_Switch	0/1	- W	✓ - W	✓ [C1+C2] On/Off (Status)	0=Off; 1=On
25	1 Bit	O	CTR--	DPT_Switch	0/1	- W	✓ - W	✓ [C2] On/Off (Status)	0=Off; 1=On
26	1 Byte	O	CTR--	DPT_Scaling	0% - 100%	- W	✓ - W	✓ [C1] Lighting Level (Status)	0 - 100%
	1 Byte	O	CTR--	DPT_Scaling	0% - 100%	- W	✓ - W	✓ [C1+C2] Lighting Level (Status)	0 - 100%
27	1 Byte	O	CTR--	DPT_Scaling	0% - 100%	- W	✓ - W	✓ [C2] Lighting Level (Status)	0 - 100%
28	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C1] Custom On/Off 1	0=Off; 1=On
	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C1+C2] Custom On/Off 1	0=Off; 1=On
29	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C2] Custom On/Off 1	0=Off; 1=On
30	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C1] Custom On/Off 2	0=Off; 1=On
	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C1+C2] Custom On/Off 2	0=Off; 1=On
31	1 Bit	I	C--W-	DPT_Switch	0/1	-	-	[C2] Custom On/Off 2	0=Off; 1=On
32	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1] Simple Timer	0=Deactivate; 1=Activate
	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1+C2] Simple Timer	0=Deactivate; 1=Activate
33	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C2] Simple Timer	0=Deactivate; 1=Activate
34	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1] Flashing	0=Deactivate; 1=Activate
	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1+C2] Flashing	0=Deactivate; 1=Activate
35	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C2] Flashing	0=Deactivate; 1=Activate
36	1 Byte	I	C--W-	DPT_SceneControl	0-63; 128-191	-	-	[C1] Scenes/Sequences	Scene/Sequence value
	1 Byte	I	C--W-	DPT_SceneControl	0-63; 128-191	-	-	[C1+C2] Scenes/Sequences	Scene/Sequence value
37	1 Byte	I	C--W-	DPT_SceneControl	0-63; 128-191	-	-	[C2] Scenes/Sequences	Scene/Sequence value
38	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1] Start/Stop Sequence	0=Stop; 1=Start
	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C1+C2] Start/Stop Sequence	0=Stop; 1=Start
39	1 Bit	I	C--W-	DPT_Start	0/1	-	-	[C2] Start/Stop Sequence	0=Stop; 1=Start
40	1 Bit	I/O	C-RW-	DPT_Enable	0/1	-	-	[C1] Lock	0=Unlock; 1=Lock
	1 Bit	I/O	C-RW-	DPT_Enable	0/1	-	-	[C1+C2] Lock	0=Unlock; 1=Lock
41	1 Bit	I/O	C-RW-	DPT_Enable	0/1	-	-	[C2] Lock	0=Unlock; 1=Lock
42	1 Bit	I/O	C-RW-	DPT_Enable	0/1	-	✓ -	✓ Lock manual control	0=Unlock; 1=Lock
	1 Bit	I/O	C-RW-	DPT_Enable	0/1	-	✓ -	✓ Lock manual control	1=Unlock; 0=Lock
43	1 Byte	I	C--W-	20.xxx	0/1/2	-	✓ -	✓ [C1] Edge Select (Only for Test Purposes)	0=Automatic; 1=Leading; 2=Trailing
	1 Byte	I	C--W-	20.xxx	0/1/2	-	✓ -	✓ [C1+C2] Edge Select (Only for Test Purposes)	0=Automatic; 1=Leading; 2=Trailing
44	1 Byte	I	C--W-	20.xxx	0/1/2	-	✓ -	✓ [C2] Edge Select (Only for Test Purposes)	0=Automatic; 1=Leading; 2=Trailing
45	1 Byte	I	C--W-	Dimming_Pattern_Non-	0/1/2	-	✓ -	✓ [C1] Dimming Pattern (Only for Test	0=Linear; 1=Curve 1; 2=Curve 2

				standard DPT					Purposes)	
	1 Byte	I	C - - W -	Dimming_Pattern_Non-standard DPT	0/1/2	-	✓	-	✓ [C1+C2] Dimming Pattern (Only for Test Purposes)	0=Linear; 1=Curve 1; 2=Curve 2
46	1 Byte	I	C - - W -	Dimming_Pattern_Non-standard DPT	0/1/2	-	✓	-	✓ [C2] Dimming Pattern (Only for Test Purposes)	0=Linear; 1=Curve 1; 2=Curve 2
47,51	2 Byte	O	CTR - -	DPT_Value_Temp	-273.00 - 670760.00	-	-	-	[Ix] Current Temperature	Temperature sensor value
48,52	1 Bit	O	CTR - -	DPT_Alarm	0/1	-	-	-	[Ix] Overcooling	0 = No Alarm; 1 = Alarm
49,53	1 Bit	O	CTR - -	DPT_Alarm	0/1	-	-	-	[Ix] Overheating	0 = No Alarm; 1 = Alarm
50,54	1 Bit	O	CTR - -	DPT_Alarm	0/1	-	-	-	[Ix] Probe Error	0 = No Alarm; 1 = Alarm
55	1 Byte	I	C - - W -	DPT_SceneControl	0-63; 128-191	-	-	-	[Motion Sensor] Scene Input	Scene Value
56	1 Byte		CT - - -	DPT_SceneControl	0-63; 128-191	-	-	-	[Motion Sensor] Scene Output	Scene Value
57,81	1 Byte	O	CTR - -	DPT_Scaling	0% - 100%	-	-	-	[Ix] Luminosity	0-100%
58,82	1 Bit	O	CTR - -	DPT_Alarm	0/1	-	-	-	[Ix] Open Circuit Error	0 = No Error; 1 = Open Circuit Error
59,83	1 Bit	O	CTR - -	DPT_Alarm	0/1	-	-	-	[Ix] Short Circuit Error	0 = No Error; 1 = Short Circuit Error
60,84	1 Byte	O	CTR - -	DPT_Scaling	0% - 100%	-	-	-	[Ix] Presence State (Scaling)	0-100%
61,85	1 Byte	O	CTR - -	DPT_HVACMode	1=Comfort 2=Standby 3=Economy 4=Building Protection	-	-	-	[Ix] Presence State (HVAC)	Auto, Comfort, Standby, Economy, Building Protection
62,86	1 Bit	O	CTR - -	DPT_Occupancy	0/1	-	-	-	[Ix] Presence State (Binary)	Binary Value
	1 Bit	O	CTR - -	DPT_Trigger	0/1	-	-	-	[Ix] Presence: Slave Output	1 = Motion Detected
63,87	1 Bit	I	C - - W -	DPT_Trigger	0/1	-	-	-	[Ix] Presence Trigger	Binary Value to Trigger the Presence Detection
64,88	1 Bit	I	C - - W -	DPT_Trigger	0/1	-	-	-	[Ix] Presence: Slave Input	0 = Nothing; 1 = Detection from slave device
65,89	1 Bit	I	C - - W -	DPT_Trigger	0/1	-	-	-	[Ix] External Motion Detection	0 = Nothing; 1 = Motion detected by an external sensor
66,90	1 Byte	O	CTR - -	DPT_Scaling	0% - 100%	-	-	-	[Ix][C1] Detection State (Scaling)	0-100%
67,91	1 Byte	O	CTR - -	DPT_HVACMode	1=Comfort 2=Standby 3=Economy 4=Building Protection	-	-	-	[Ix][C1] Detection State (HVAC)	Auto, Comfort, Standby, Economy, Building Protection
68,92	1 Bit	O	CTR - -	DPT_Switch	0/1	-	-	-	[Ix][C1] Detection State (Binary)	Binary Value
69,93	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-	-	[Ix][C1] Channel Lock	According to parameters
70,94	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-	-	[Ix][C1] Force State	0 = No Detection; 1 = Detection
71,95	1 Byte	O	CTR - -	DPT_Scaling	0% - 100%	-	-	-	[Ix][C2] Detection State (Scaling)	0-100%
72,96	1 Byte	O	CTR - -	DPT_HVACMode	1=Comfort 2=Standby 3=Economy 4=Building Protection	-	-	-	[Ix][C2] Detection State (HVAC)	Auto, Comfort, Standby, Economy, Building Protection
73,97	1 Bit	O	CTR - -	DPT_Switch	0/1	-	-	-	[Ix][C2] Detection State (Binary)	Binary Value
74,98	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-	-	[Ix][C2] Channel Lock	According to parameters
75,99	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-	-	[Ix][C2] Force State	0 = No Detection; 1 = Detection

76,100	1 Byte	O	CT R - -	DPT_Scaling	0% - 100%				[Ix][C3] Detection State (Scaling)	0-100%
77,101	1 Byte	O	CT R - -	DPT_HVACMode	1=Comfort 2=Standby 3=Economy 4=Building Protection	-	-		[Ix][C3] Detection State (HVAC)	Auto, Comfort, Standby, Economy, Building Protection
78,102	1 Bit	O	CT R - -	DPT_Switch	0/1	-	-		[Ix][C3] Detection State (Binary)	Binary Value
79,103	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-		[Ix][C3] Channel Lock	According to parameters
80,104	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-		[Ix][C3] Force State	0 = No Detection; 1 = Detection
105,111	1 Bit	I	C - - W -	DPT_Switch	0/1	-	-		[Ix] Input Lock	1 = Locked; 0 = Unlocked
106,112	1 Bit		CT - - -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] 0	Sending of 0
	1 Bit		CT - - -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] 1	Sending of 1
	1 Bit	I	CT - W -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] 0/1 Switching	Switching 0/1
	1 Bit		CT - - -	DPT_UpDown	0/1	- W	- W		[Ix] [Short Press] Move Up Shutter	Sending of 0 (Up)
	1 Bit		CT - - -	DPT_UpDown	0/1	- W	- W		[Ix] [Short Press] Move Down Shutter	Sending of 1 (Down)
	1 Bit		CT - - -	DPT_UpDown	0/1	- W	- W		[Ix] [Short Press] Move Up/Down Shutter	Switching 0/1 (Up/Down)
	1 Bit		CT - - -	DPT_Step	0/1	- W	- W		[Ix] [Short Press] Stop/Step Up Shutter	Sending of 0 (Stop/Step up)
	1 Bit		CT - - -	DPT_Step	0/1	- W	- W		[Ix] [Short Press] Stop/Step Down Shutter	Sending of 1 (Stop/Step down)
	1 Bit		CT - - -	DPT_Step	0/1	- W	- W		[Ix] [Short Press] Stop/Step Shutter (switched)	Switching of 0/1 (Stop/Step up/down)
	4 Bit		CT - - -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	- W	- W		[Ix] [Short Press] Brighter	Increase Brightness
	4 Bit		CT - - -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	- W	- W		[Ix] [Short Press] Darker	Decrease Brightness
	4 Bit		CT - - -	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	- W	- W		[Ix] [Short Press] Brighter/Darker	Switch Bright/Dark
	1 Bit		CT - - -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] Dimmer ON	Sending of 1 (ON)
	1 Bit		CT - - -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] Dimmer OFF	Sending of 0 (OFF)
	1 Bit	I	CT - W -	DPT_Switch	0/1	- W	- W		[Ix] [Short Press] Dimmer ON/OFF	Switching 0/1

	1 Byte		CT---	DPT_SceneControl	0-63; 128-191	- W	- W	[Ix] [Short Press] Run Scene	Sending of 0 - 63
	1 Byte		CT---	DPT_SceneControl	0-63; 128-191	- W	- W	[Ix] [Short Press] Save Scene	Sending of 128 - 191
	1 Bit	I/O	CTRW	DPT_Switch	0/1	- W	- W	[Ix] [Switch/Sensor] Edge	Sending of 0 or 1
	1 Byte		CT---	DPT_Value_1_Ucount	0 - 255	- W	- W	[Ix] [Short Press] Constant Value (Integer)	0 - 255
	1 Byte		CT---	DPT_Scaling	0% - 100%	- W	- W	[Ix] [Short Press] Constant Value (Percentage)	0% - 100%
	2 Byte		CT---	DPT_Value_2_Ucount	0 - 65535	- W	- W	[Ix] [Short Press] Constant Value (Integer)	0 - 65535
	2 Byte		CT---	9.xxx	-671088.64 - 670760.96	- W	- W	[Ix] [Short Press] Constant Value (float)	Float value
107,113	1 Byte	I	C--W-	DPT_Scaling	0% - 100%	- W	- W	[Ix] [Short Press] Shutter Status (input)	0% = Top; 100% = Bottom
	1 Byte	I	C--W-	DPT_Scaling	0% - 100%	- W	- W	[Ix] [Short Press] Dimming Status (input)	0% - 100%
108,114	1 Bit		CT---	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] 0	Sending of 0
	1 Bit		CT---	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] 1	Sending of 1
	1 Bit	I	CT-W-	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] 0/1 Switching	Switching 0/1
	1 Bit		CT---	DPT_UpDown	0/1	- W	- W	[Ix] [Long Press] Move Up Shutter	Sending of 0 (Up)
	1 Bit		CT---	DPT_UpDown	0/1	- W	- W	[Ix] [Long Press] Move Down Shutter	Sending of 1 (Down)
	1 Bit		CT---	DPT_UpDown	0/1	- W	- W	[Ix] [Long Press] Move Up/Down Shutter	Switching 0/1 (Up/Down)
	1 Bit		CT---	DPT_Step	0/1	- W	- W	[Ix] [Long Press] Stop/Step Up Shutter	Sending of 0 (Stop/Step up)
	1 Bit		CT---	DPT_Step	0/1	- W	- W	[Ix] [Long Press] Stop/Step Down Shutter	Sending of 1 (Stop/Step down)
	1 Bit		CT---	DPT_Step	0/1	- W	- W	[Ix] [Long Press] Stop/Step Shutter (switched)	Switching of 0/1 (Stop/Step up/down)
	4 Bit		CT---	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	- W	- W	[Ix] [Long Press] Brighter	Long Pr. -> Brighter; Release -> Stop
	4 Bit		CT---	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%) ... 0xF (Inc. by 1%)	- W	- W	[Ix] [Long Press] Darker	Long Pr. -> Darker; Release -> Stop
	4 Bit		CT---	DPT_Control_Dimming	0x0 (Stop) 0x1 (Dec. by 100%) ... 0x8 (Stop) 0x9 (Inc. by 100%)	- W	- W	[Ix] [Long Press] Brighter/Darker	Long Pr. -> Brighter/Darker; Release -> Stop

					...	0xF (Inc. by 1%)				
	1 Bit		CT---	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] Dimmer ON	Sending of 1 (ON)	
	1 Bit		CT---	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] Dimmer OFF	Sending of 0 (OFF)	
	1 Bit	I	CT-W-	DPT_Switch	0/1	- W	- W	[Ix] [Long Press] Dimmer ON/OFF	Switching 0/1	
	1 Byte		CT---	DPT_SceneControl	0-63; 128-191	- W	- W	[Ix] [Long Press] Run Scene	Sending of 0 - 63	
	1 Byte		CT---	DPT_SceneControl	0-63; 128-191	- W	- W	[Ix] [Long Press] Save Scene	Sending of 128 - 191	
	1 Bit	O	CTR--	DPT_Alarm	0/1	- W	- W	[Ix] [Switch/Sensor] Alarm: Breakdown or sabotage	1 = Alarm; 0 = No Alarm	
	2 Byte		CT---	9.xxx	-671088.64 - 670760.96	- W	- W	[Ix] [Long Press] Constant Value (float)	Float value	
	2 Byte		CT---	DPT_Value_2_Ucount	0 - 65535	- W	- W	[Ix] [Long Press] Constant Value (Integer)	0 - 65535	
	1 Byte		CT---	DPT_Scaling	0% - 100%	- W	- W	[Ix] [Long Press] Constant Value (Percentage)	0% - 100%	
	1 Byte		CT---	DPT_Value_1_Ucount	0 - 255	- W	- W	[Ix] [Long Press] Constant Value (Integer)	0 - 255	
109,115	1 Bit		CT---	DPT_Trigger	0/1	- W	- W	[Ix] [Long Press/Release] Stop Shutter	Release -> Stop Shutter	
110,116	1 Byte	I	C--W-	DPT_Scaling	0% - 100%	50% W	- W	[Ix] [Long Press] Dimming Status (input)	0% - 100%	
	1 Byte	I	C--W-	DPT_Scaling	0% - 100%	50% W	- W	[Ix] [Long Press] Shutter Status (input)	0% = Top; 100% = Bottom	
117-148	1 Bit	I	C--W-	DPT_Bool	0/1	-	-	[LF] (1 bit) Data Entry X	Binary Data Entry (0/1)	
149-164	1 Byte	I	C--W-	DPT_Value_1_Ucount	0 - 255	-	-	[LF] (1 byte) Data Entry X	1 byte Data Entry (0-255)	
	2 Byte	I	C--W-	DPT_Value_2_Ucount	0 - 65535	-	-	[LF] (2 bytes) Data Entry X	2 bytes Data Entry	
165-180	2 Byte	I	C--W-	DPT_Value_2_Count	-32768 - 32767	-	-	[LF] (2 bytes) Data Entry X	2 bytes Data Entry	
	2 Byte	I	C--W-	DPT_Value_Temp	-273.00 - 670760.00	-	-	[LF] (2 bytes) Data Entry X	2 bytes Data Entry	
181-188	4 Byte	I	C--W-	DPT_Value_4_Count	-2147483648 - 2147483647	-	-	[LF] (4 bytes) DataEntry X	4 bytes Data Entry	
	1 Bit	O	CTR--	DPT_Bool	0/1	-	-	[LF] Function X - Result	(1 bit) Boolean	
	1 Byte	O	CTR--	DPT_Value_1_Ucount	0 - 255	-	-	[LF] Function X - Result	(1 byte) Unsigned	
	2 Byte	O	CTR--	DPT_Value_2_Ucount	0 - 65535	-	-	[LF] Function X - Result	(2 bytes) Unsigned	
189-198	4 Byte	O	CTR--	DPT_Value_4_Count	-2147483648 - 2147483647	-	-	[LF] Function X - Result	(4 bytes) Signed	
	1 Byte	O	CTR--	DPT_Scaling	0% - 100%	-	-	[LF] Function X - Result	(1 byte) Percentage	
	2 Byte	O	CTR--	DPT_Value_2_Count	-32768 - 32767	-	-	[LF] Function X - Result	(2 bytes) Signed	
	2 Byte	O	CTR--	DPT_Value_Temp	-273.00 - 670760.00	-	-	[LF] Function X - Result	(2 bytes) Float	

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